

# USING THE PATTERNS-OF-PARTICIPATION APPROACH TO UNDERSTAND HIGH SCHOOL MATHEMATICS TEACHERS' CLASSROOM PRACTICE IN SAUDI ARABIA

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*In this paper, patterns-of-participation theory serves as a lens to interpret and understand Saudi high school mathematics teachers' practices during the current reform movement and the role the new textbooks play in influencing teachers practice. The data presented is about Haya and Nora, two experienced, high school mathematics teachers. Generally, Nora's and Haya's practice as high school mathematics teachers reveals patterns of tension and confusion with regards to understanding the current reform movement in Saudi Arabia.*

## INTRODUCTION

One of the main goals of most education reform initiatives has been to change teachers' classroom practices. The most recent reform curricula focuses on highlighting teacher practices that promote and evoke students' understanding of mathematics alongside the changes in content (Tirosh & Graeber, 2003). Changes to a teacher's role that are included in the education reform movement call for more research in order to understand and theorise about teachers' classroom practices. The Saudi Arabian education system has undergone major changes in the past decade. Government agencies involved in education have introduced new policies, standards, programs, and curricula with the expectation that teachers incorporate the changes seamlessly and without consideration of existing beliefs and practices. My main research goal is to gain a better understanding of how high school mathematics teachers in Saudi Arabia are coping with recent education reform including how their practices are changing in response to the changes that are happening in the education system in general, and specifically, to the introduction of the new mathematics textbooks. In this article, patterns-of-participation (PoP) (Skott, 2010, 2013) approach will serve as a lens to interpret and understand Saudi high school mathematics teachers' practices during the current reform movement and the role the new textbooks play in influencing teachers practice.

### **Textbooks in mathematics classroom:**

For a long time, school mathematics has been associated with textbooks and curriculum material (Remillard, 2005). According to *Trends in International Mathematics and Science Study* (TIMSS), textbooks and documents such as exercise resources for use in classrooms as teaching aids, remain important elements in mathematics classrooms in many countries. Textbooks play an important role in shaping the curriculum experiences of mathematics (TIMSS 2011). This fact is

especially true in Saudi Arabian high schools. Textbooks provide teachers with a basic outline for thinking about what mathematics should be taught, when, and how. In 2010, the Ministry of Education introduced new mathematics textbooks, the primary, and sometimes only, resource for teachers. The Ministry sees this initiative as a major step towards creating change in teaching practices.

In Saudi Arabia textbooks have official status clearly reflecting official curriculum. The new approved mathematics textbooks in Saudi Arabia are based on the curricula published by McGraw Hill Education learning company. According to the ministry of education in Saudi Arabia, the new mathematics curriculum aims to (a) help students to develop higher-order mathematics thinking skills, (b) develop ways of mastering these skills, (c) construct a strong conceptual foundation in mathematics that enable students to apply their knowledge, (d) make connections between related mathematical concepts and between mathematics and the real world, and (e) apply mathematics logically to solve problems from daily life (Ministry of Education of Saudi Arabia, 2013).

Traditionally, curriculum materials or textbooks have been a center agent of policies to regulate mathematics practice in ways that parallel instruction with the reform perspective (Remillard, 2005). Textbooks are often the main resource for students and teachers in the classroom, offering the everyday materials of lessons and guiding the activities teachers and students do. As a result, educational policy makers use textbooks as an essential means to decide what students learn (Battista & Clements, 2000).

Research on teachers' curriculum use focuses on understanding how teachers "interact with, draw on, refer to, and are influenced by" curricular materials when designing their lessons (Remillard, 2005, p.212). While effective student learning is one expected outcome of textbook use, the development of teachers' techniques and practice is an additional desired outcome. Researchers have only recently started to shed the light on the impact of curriculum materials on teachers and how teachers use them (Remillard, Herbel-Eisenmann, & Lloyd, 2009). The focus of how teachers interact with and use curriculum materials has not been always considered significant to studying curriculum. Historically, research about school curricula relied mainly on examining the textbooks to restructure the contents of classroom practice (Love & Pimm, 1996). Reform efforts in mathematics education are the product of curriculum development supported by standards adopted by the National Council of Mathematics Teachers (NCTM, 2000). Teachers face the demand of applying new curriculum materials, and adopt new conceptual and pedagogical approaches to teach new standards-based curriculum (Remillard, 2005).

## **THEORETICAL FRAMEWORK**

Skott (2010, 2013) introduced PoP as a promising framework, which provides coherent and dynamic theoretical understandings of mathematics teacher practices. Skott's (2009, 2013) main motivation in developing this framework was to overcome

the conceptual and methodological problems of belief research. Although some researchers such as McLeod and McLeod (2002) note that there has been significant advancement in the study of beliefs and affect in mathematics learning, the progress can be more noticed in relation to theoretical aspects, researchers still call for more extensive studies to assure that progress exists in the quality of instruction. However, Skott (2009, 2013) views the call for more work to do, after all what has been done, in the field for beliefs research as a negative sign. “To a large extent, then, belief research is still conceived of as a promising field of study. Phrased negatively, however, its still-promising character suggests that after 20 years of persistent effort, the field has still not lived up to the expectations of its founders” (Skott, 2009, p. 28).

The challenges and complexity associated with beliefs research has led some researchers, such as Skott (2009, 2013) and Gates (2006), to call for more social approaches to beliefs research. Gates (2006) indicates that there is a need to take a social approach when studying teacher belief systems because it will shift focus from cognitive constructs. A change toward sociological constructs will balance existing views about the nature and genesis of beliefs. Skott (2010) also supports this view indicating that taking a context – practice approach by adopting PoP as a framework provides more coherent and dynamic understandings of teaching practices. Furthermore, it will help in resolving some of the conceptual and methodological problems of a belief–practice approach while maintaining an interest in the meta-issues that constitute the field of beliefs.

The social approach of research in mathematics education has progressively promoted the notion that practice is not only a personal individual matter; it is in fact situated in the sociocultural context. Although the relationships between individual and social factors of human functioning have generated much debate in mathematics education, it is mainly in relation to student learning (Skott, 2013). Therefore, PoP is a theoretical framework that aims to understand the relationships between teachers’ practice and social factors. To a considerable degree, PoP adopts participationism as a metaphor for human functioning more than mainstream belief research. Therefore, PoP draws on the work of participationism researchers, specifically Vygotsky, Lave and Wenger, and Sfard.

Skott (2010) initially developed the patterns-of-participation framework in relation to teachers’ beliefs. However, in order to develop a more coherent approach to understand teachers’ practices, Skott (2013) extended the framework to include knowledge and identity. Research on teachers has mainly focused on studying three relatively distinct domains: teachers’ knowledge, beliefs, and identity. This leads to some incoherence that negatively influences the understanding of the teachers’ role in classrooms. Skott presents PoP as a coherent, participatory framework that is capable of dealing with matters usually faced in the distinct fields of teachers’ knowledge, beliefs, and identity.

## METHODOLOGY

This paper is part of an ongoing study that intends to develop more coherent understandings of Saudi high school mathematics teachers' practices during the current reform movement. The data presented in this paper comes from two experienced high school mathematics teachers Nora and Haya. Nora has 13 years of experience teaching mathematics in public and private middle and high school in Saudi Arabia. She has a Bachelor degree of Science with a specialization in mathematics. Nora has never taken any education courses. Haya has 10 years of experience in public high school. She has a Bachelor degree of Education with a specialization in mathematics. The education courses Haya had in university focused on general issues related to teaching, such as lesson planning and classroom management.

I conducted a 60-minute, semi-structured interview with both participants. I invited them to reflect on their experiences with mathematics and its teaching and learning during their years of experience. During the interview, they expressed their views about the recent reform movement in Saudi Arabia. I also asked them to reflect on their experience teaching mathematics using the old and new textbooks. Interviews were audio recorded and transcribed. As used by Skott (2013), I used a qualitative analysis approach based on grounded theory method.

## DISCUSSION

### **Being a teacher in an era of educational reform**

Nora shows her deep personal commitment to current educational reform in Saudi Arabia. She believes that the pace of educational reform has been increasing at the global level and Saudi Arabia needs to join the global movement of education reform. She emphasizes the need to be reasonable and fair when we talk about recent reform efforts. She explains, "reform is one of the controversial topics among people who are interested in educational issues in Saudi Arabia...but we have to admit, changing is difficult and complicated". In the interview, Nora indicates that success of reform movements depends, at least in part, on the degree of match between teachers' perceptions of the teaching practice and their role as teachers, and the demands of the reform movement. She states that "creating a positive change starts with creating a motivated teacher".

Haya on other hand has more skeptical view about recent reform movement in Saudi Arabia. She states, "I think reform ideas are something nice to read about in a book or something. These ideas usually are not applicable to a real world classroom". She argues that many teachers are confused when it comes to understanding the goals of the recent reform movement. She blames the Ministry of Education for this confusion. She explains that, on one hand, the Ministry introduces new mathematics curriculum which they claim will change the culture of mathematics learning in schools towards a focus on reasoning and problem solving, but on the other hand, the Ministry established new standardized tests for high school students which maintains a traditional

teacher-centered and exam-based educational environment. She claims that the ultimate teaching objective “was and still is” to improve students’ exam marks and the recent reform movement failed to change this objective.

### **New mathematics textbooks impact**

Nora expresses that before the introduction of the new textbooks, she was very enthusiastic. She believes that the new textbooks are generally better than the old textbooks. She also believes that the new textbook supports student learning and creates more positive and engaging environment in the classroom. However, Nora indicates that she feels isolated and unsupported in her use of the new curriculum materials. She states, “Very often I have questions about the textbook, but I don’t know where I can’t find answers”. She complains that the Ministry of Education did not take teachers’ preparation of the use of the new textbooks into account. She indicates that the only other resource she has besides the teacher's guide is her communication with other mathematics teachers in her school. Conversations Nora has with other teachers provide support and a rich resource for Nora’s practice. After the implementation of the new textbooks, Nora and her colleagues started talking more about teaching mathematics.

Nora comments about her teaching using the new textbooks; “although I feel that the new textbook could offer a better learning experience to the student.., I am not sure if I am using it effectively...I’ve been trying to change since we adopted the new textbooks, but sometimes I feel that changes are not obvious in my practice.” She indicates that the textbooks motivate her to reflect on her own teaching practice. She explains that teachers need to learn not only from textbook but also from their own teaching practice.

Nora argues that one of the most positive aspects about the new textbooks is that many of the activities ask students to explain and express their understanding. Nora says that her students find it difficult to put their understanding into words because they are simply not used to talking in the mathematics classroom as they do in other classes. However, Nora indicates that some of the activities presented in the textbook do not make sense. She explains, “I honestly don’t feel that I should let the textbook control what I do in the classroom all the time”. It seems to me that Nora struggles with eliminating the authority of the textbook on her practice.

Haya’s unsettling sense of confusion regarding curriculum change is noticeable in her remarks. While she indicated that the new textbooks are better than the old textbooks, she is sceptical about the impact these textbooks could have on teaching practice. Haya believes that most mathematics teachers have outdated perceptions of mathematics teaching and learning and merely changing the textbooks is not going to change teachers’ perceptions. She expresses her frustration about the big gap between society’s high expectations towards teachers and teachers’ real capability of meeting these expectations.



When Haya describes her teaching practice after she started using the new textbooks, she explicitly indicates that change is something she thinks about more than she actually applies in her classroom. She explains that sometimes her classroom seems more interactive and engaging, but what students actually learn is very limited. She also criticizes the new textbooks because they do not address students' different mathematical ability levels. She thinks the textbooks are designed for students with strong mathematical skills but students with low skills find many activities of the textbooks confusing.

### **What does it mean to do mathematics?**

During the interview, Nora discusses the issues of classroom culture around what it means to "do mathematics". She believes that there is a common culture in school mathematics which views doing mathematics as sitting quietly at a desk, finishing a worksheet, using the textbook as a main resource and turning in the completed work prior to class ending. The new textbooks, in Nora's view, challenge this old lasting culture. Nora comments on the textbook's presentation of situational problems which are connected with real life situations. She believes that the textbook surely make some positive transformations compared to old textbooks, which simply delivered mathematical concepts in a very isolated manner. However, she also indicates that making the connection is not always easy.

Both teachers consider examinations as being powerful force in forming and directing how teachers and students do mathematics. Doing mathematics in Haya's classroom is extremely influenced by students' achievement and tests marks. She argues that high school students care most about doing well in school exams and standardized tests. She explains her job as a teacher is to help her students "know how to do mathematics". Haya also comments on some activities in the textbook which encourage students to explain their understanding and justify their solutions. She indicates that she tries as much as she can to include these activities in her classroom practice, but at the same time, she claims that high school is too late to start encouraging students to master these types of communication skills in the mathematics classroom.

## **RESULTS AND CONCLUSION**

Both teachers show their commitment to the profession and express their concern for doing what is best for their students. They both indicate that the content and structure of the textbooks changed significantly from the former textbooks. Students' achievement and tests marks are significant to the classroom practice of both teachers. Also, Nora's and Haya's practice as high school mathematics teachers reveals patterns of tension and confusion with regards to understanding the current reform movement in Saudi Arabia. The lack of support and guidance both teachers received before and after the implantation of the new textbooks has a negative impact on their use of the textbooks in their classrooms. Both teachers developed a sense of isolation in the current reform movement. Also, part of the tension both teachers are experiencing

comes from their struggle with eliminating the authority of the textbook in their practice.

Both teachers have developed a sense of obligation and stress to improve their teaching practice. Nora seems more motivated about improving her teaching practice; she uses the new textbook as a tool for self-directed professional development. The different perspective the new textbook offers about mathematics learning encourage her to reflect more on her teaching practice. Also, Nora's interaction with other teachers in her school is significant to her classroom practice.

Haya on the other hand appears less motivated about the making changes to her teaching practice. It seems that her perceptions on teaching and learning are being compelled to change in order to keep up with reform demands. She is uncertain about the meaning of the change and has some resistances to making changes in her practice. With her struggles to make some changes in her practice, her conceptions of teaching and learning mathematics seem to remain the same. Although she indicates she was very supportive about the implementation of the new textbooks, a sense of uncertainty about the value of the new textbooks started to emerge in her practices.

Understanding the patterns in the ways in which the two teachers participate in these practices and contribute to their constant reconstitution and renegotiation of their teaching is a complex task. Using the data I collected from the interviews, I was able to get a sense of some of the practices that are significant to the two teachers' classrooms participation. However, to develop a better understanding of both teachers' practice as mathematics teachers, more data is needed. The use of multiple open interviews in combination with observations of classroom and staff-room interactions may allow access to practices and figured worlds beyond the classroom (Skott, 2013). Skott (2013) also suggest that "teacher's narratives about her own schooling; about formal and informal collaborative activities with her colleagues; and about discursive manifestations such as the reform" provide deeper understanding to the meanings teachers bring to their classroom practice (p. 552).

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